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Health information technology uses for primary prevention in preventive medicine: A scoping review protocol

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Keywords: Scoping Review, Health Information Technologies, Preventive Medicine, Digital Health

ABSTRACT

Introduction: The use of health information technologies (HITs) has been associated with positive benefits such as improved health outcomes and improved health services. Results from empirical studies reported potential benefits of HITs in preventive medicine measures such as primary prevention. This review will examine the broad range of HITs and their uses and effectiveness in primary prevention.

Methods and analysis: We will conduct searches in relevant databases (MEDLINE, EMBASE, the Cochrane Methodology Register and Cochrane Database of Systematic Reviews.) using Arksey and O'Malley's scoping review methodology. The scoping review will include all study designs to identify the literature on health information technology uses. Two reviewers will independently screen the literature following our screening criteria and using a data abstraction form. Findings will be summarized quantitatively (using numerical counts of HITs) and qualitatively (using narrative synthesis).

Ethics and dissemination

The study will synthesize data from published literature and will not require an ethical approval. The results of the review will be disseminated through a peer-reviewed journal.

Registration

The review protocol will be submitted to PROSPERO.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- A strength of this study is that it will conduct a comprehensive review of the relevant databases to help inform healthcare professionals, researchers and policy makers about the latest uses of HITs for preventive medicine purposes.
- A strength of this study will also help identify gaps in the literature concerning HITs and their effectiveness and uses in preventive medicine.
- A limitation of this study is that it will only include English language publications.
- A limitation of this study is that it will not perform a formal quality assessment of included studies.

BACKGROUND

Health information technology (HIT) include technologies that enable health information to be stored, disseminated and analysed [1] and are increasingly used to improve the health of patients and populations. Popular examples of HITs include electronic health records, smartphone health applications (apps) and electronic prescriptions (E-prescribing) [1]. Evidence from existing systematic reviews and empirical studies found positive effects of using HITs in improving health outcomes. Research shows that HITs can not only improve health outcomes but also contribute to preventing disease and improving preventive medicine practices. Preventive medicine is the practice that focuses on keeping individuals healthy and its goal is to "protect, promote, and maintain health and well-being and to prevent disease, disability, and death" [2]. Primary prevention is one of the preventive medicine measures and it is defined as the prevention of "the initial occurrence of a disorder" by the World Health Organization [3]. Despite the potential benefits HITs can have to improve primary prevention, and the availability of studies about the use of HITs for primary prevention, there are currently no studies that comprehensively review the different types of HITs and their uses in primary prevention.

HITs have seen a growing interest in the literature in recent years and have been repeatedly associated with preventing disease [4-6] improving health outcomes [7] improving data collection, and the potential to substantially advance healthcare research [8-10]. As different HITs proliferate, questions about their effectiveness are being raised. HITs are associated with positive outcomes in healthcare in general such as "efficiency of care", "effectiveness of care" and "patient safety" [10].

Reviews related to the use of HITs in primary prevention focus on only one or two types of health information technologies (e.g. telephone-based interventions only) [11]. Most of the studies that focus on primary prevention outcomes focus on one tool or method of HITs like electronic health records [8] or mobile health technologies [5]. However, these studies are not representative of the whole range of HITs that can be used in primary prevention. In addition, some of the currently available reviews, even if includes more than one HIT, only focuses on one or two primary prevention outcomes (e.g. smoking) [9].

This review will focus on gathering information on what is available rather than which interventions work best. This general focus allows the examination of all the available interventions in health information technologies. In this review, we will map out the findings and results of studies published about health information technologies and their uses in primary prevention preventive

medicine. A scoping review can help clarify to what extent are HITs used for primary prevention purposes and what is the range of the HITs available. We will synthesize the available evidence to inform how technology could be developed to impact primary prevention in preventive medicine. In this protocol we have reviewed some HITs used for primary prevention in Table 1, as example of the scoping review outcomes that will result from the study.

Intervention	**Primary prevention uses**	**Description of intervention**
Mobile phone messaging (SMS or MMS)	Smoking cessation (Rodgers et al., 2005)	Personalized smoking-related and general healthy behaviour-related messages sent to participants as part of a smoking cessation programme. The intervention had other features like being able to text other participants, requesting texts on quitting-related tips and taking polls and quizzes about smoking [9].
	Adherence in taking vitamin C for preventive reasons (Cocosila et al., 2009)	Text message sent from a virtual character to remind to take a Vitamin C pill to participants, where they are expected to "acknowledge" the reminder. If the text was acknowledged an encouraging message is sent, if not, a reminder message in sent. The encouraging messages were described as amusing while the reminder messages were described as "non-amusing" [12].
	Healthy behaviour in children (Shapiro et al., 2008)	Feedback text messages sent as part of a programme to promote healthy behaviors in children (to increase physical activity, reduce sugary beverage consumption and screen time). The feedback text messages were sent once the participants send a text message informing their achievement of predetermined healthy behaviour related goals [13].
Internet-based interventions	Smoking prevention (Buller et al., 2008)	Internet-based programme for school-children that uses "audio narration, graphics, animation, sound effects, and music" to deliver lessons for smoking prevention with survey questions asked to personalize the lessons for the student [14].
	HIV prevention (Kasatpibal et al., 2014)	Internet-based educational programme that uses "texts, pictures, animation, animated cartoons, videos, message boards, and exercise" to teach about the risks of HIV for men who have sex with men [15].

	Obesity prevention (Rerksuppaphol and Rerksuppaphol, 2017)	Internet-based programme for school-aged children to track weight and nutrition-related information and provide personalized information about nutrition and physical activity based on the user's weight/health status [16].
Telephone-based intervention	Postpartum depression prevention (Lewis et al., 2012)	A telephone-based intervention to increase exercise (known to prevent postpartum depression) as part of a prevention programme. The telephone-based intervention is used to inform and educate the participants about exercising, explain exercise recommendations, and encourage participants to maintain exercising [17].
Smartphone application (app)	Diabetes prevention (Fukuoka et al., 2015)	An interactive app with a "self-monitoring" tool and a list of tasks for activities that can prevent diabetes like physical activity. The app also provides encouraging feedback based on the user's input [18].

Table 1: Description of preliminary list of existing health information technology uses in primary prevention

AIMS & OBJECTIVES

The aim of this review is to provide an overview of all HITs that are used for the purpose of primary prevention or to achieve primary prevention outcomes. Through this review, the available HITs, their uses, limitations and gaps in the literature regarding their use in primary prevention will be reported. The objectives of the review are the following:

- To identify the health information technologies that are used for primary prevention.
- To identify the primary prevention patient outcomes that are improved by the use of health information technologies.
- Map out the ways health information technologies are changing/improving primary prevention compared to standard/traditional methods.

METHODS

To outline the protocol of the forthcoming scoping review, we will be using the Preferred Reporting Items for Systematic Reviews and Meta-analysis for Protocols (PRISMA-P) (Appendix 1).

Protocol Design

We will use the Arksey and O'Malley methodological framework for scoping reviews in performing the review. The framework recommends following six steps to conduct a scoping review: (1) identifying the research question; (2) identifying relevant studies; (3) selecting studies; (4) charting the data; and (5) collating, summarising and reporting the results [19]. This framework, although relatively new (2003), is the first methodological framework for scoping reviews and it has been widely used for this purpose.

Stage 1: Identifying the research question

The preliminary research (Table 1) revealed that there are no review studies that reviewed the different HIT approaches used in primary prevention and exposed a research gap that motivated the focus of this protocol. The main research question and the secondary research questions of the scoping review are displayed in Table 2.

Primary Research Questions	Secondary Research Questions
What health information technologies are used in primary prevention preventive medicine to improve individuals/patients health outcomes?	• What tools and innovations of health information technologies are used in primary prevention preventive medicine? • What primary prevention preventive medicine patient/individual health outcomes are improved by the use of HITs? • How are the use of HITs changing/improving primary prevention preventive medicine compared to standard/traditional methods?

Table 2: Scoping review primary and secondary research questions

Stage 2: Identifying relevant studies

Search strategy

For the scoping review, we will conduct searches in relevant electronic databases: MEDLINE, EMBASE, the Cochrane Methodology Register and Cochrane Database of Systematic Reviews. The literature search strategy used for Medline can be found in (Appendix 2), including the medical subheadings (MeSH) and free text terms used to perform the search. The search strategy will be modified for each database and it will not be limited in terms of year or study design. Only studies in English language will be reviewed. Apart from electronic databases, we will also search reference lists of the studies selected for full text reading to supplement the search.

Stage 3: Study Selection

Screening of the studies will be performed by two suitably experienced/qualified reviewers and in two levels. Table 3 outlines the inclusion criteria that will be used by the reviewers to determine the studies that will be included. The citation management software program; EndNote X8.2 (Clarivate Analytics, USA), will be used to manage records and data and to remove duplicates. The first screening will involve screening the title and abstracts. Using two reviewers will ensure that all relevant articles are included. The reviewers will use the pre-defined relevance criteria to determine relevant studies. In the second round of screening, the reviewers will perform full text reading of the studies identified in the previous round. Conflicts and discrepancies will be resolved by discussing with a third party.

Inclusion Criteria	
Population	• Users of the health information technologies will include individuals or patients who are treated with primary prevention preventive medicine.
Intervention	• All health information technologies (e.g. electronic health records, telemedicine, text messages, computerized decision support systems...).
Comparator	• Studies using non-health information technology interventions • Studies using traditional or usual method as a comparator to health information technology • Studies without a comparator
Outcomes	• Any primary prevention outcome that prevents a disease or a health-threatening condition or a behaviour before it occurs (e.g. chronic disease prevention, smoking prevention, obesity prevention)
Study Type	• Any study type; experimental (randomised controlled trials (RCTs), quasi-RCTs, non-RCTs), quasi-experimental (controlled before after, interrupted time series) and observational (cohort, case control, cross-sectional) and review (systematic review, meta-analysis scoping review) studies. • Only published literature will be included in the review. • Only publications in English will be included. • There will be no restrictions to calendar date.

Table 3: Review inclusion criteria

Exclusion Criteria

- Interventions that focus on secondary or tertiary prevention will be excluded to keep the focus on the primary prevention interventions only.
- Publications that are not in English will be excluded.

Stage 4: Charting the data

Two reviewers will independently extract the data and vigilantly review the studies based on the data abstraction form (Appendix 3). We assume that studies identified for this review will include basic study information like: first author and year of publication and will include information about the health information technology intervention and the methods used in the study. Quality assessment of the studies will not be completed since it is not one of the activities performed in a scoping review [19].

Stage 5: Collating, summarizing and reporting the results

The studies identified from this scoping review will be summarized and analysed using quantitative and qualitative methods. In terms of quantitative methods, we will report simple numerical counts of information such as: the total number of studies, types of primary prevention HIT interventions, descriptions of the study samples and regarding qualitative methods, we will conduct a narrative synthesis to provide an overview of the breadth of the literature and to identify gaps that may need further research. To address the three research questions of the review, we will analyse the data following three synthesis objectives: to identify the health information technologies that are used for primary prevention, to identify the primary prevention patient outcomes that are improved by the use of health information technologies and to map out the ways health information technologies are changing/improving primary prevention compared to standard/traditional methods. Table 3 displays each of the synthesis objectives of the review followed by the method, guide questions and outputs that will be used to achieve them.

Synthesis objective	**Method**	**Guide Questions**	**Outputs**
1. To identify the health information technologies that are used for primary prevention.	We will summarize the identified studies by the health information technology used	What is the health information technology? What is the purpose of the health information technology and how does the purpose contribute to primary prevention? In what setting is the primary prevention technology used? (e.g. healthcare, community setting…etc) What type of evidence does the	A list of the health information technologies used for primary prevention purposes. A list of the settings that the health information technologies are used in categorization of the primary prevention related outcomes.

		study provide for primary prevention related health outcomes?	
2. To identify the primary prevention patient outcomes that are improved by the use of health information technologies.	We will strictly identify the studies that reported significant improved patient outcomes as a result of using health information technologies	What are the studies that reported significant improved patient outcomes and what is the criteria they used to represent significance? How health information technologies that improve patient outcomes are used to improve primary prevention measures? Are there any disadvantages of using the health information technologies for primary prevention? Can the health information technology be translated and used in different healthcare-related settings?	Identification of the health information technologies that contribute significant improved patient outcomes in the literature. A thematic report of the health information technology uses in primary prevention.

3. Map out the ways health information technologies are changing/improving primary prevention compared to standard/traditional methods.	We will identify the articles that compare health information technology interventions to traditional or standard interventions	Did the study compare primary prevention health outcomes to other standard or traditional methods of primary prevention? What outcomes did the study report to compare the health information technologies to other methods? How long were the health information technologies and other methods compared for?	A summary of the health information technologies that were reported to have superior primary prevention outcomes when compared to traditional or standard methods to map out the specific health information technologies that have been compared to traditional or standard methods of primary prevention.

Table 4: Data analysis plan by the synthesis objectives and anticipated outputs

Patient and Public Involvement

Research interests identified and prioritised by the members of the public in a workshop by the European Scientific Institute, on July 2018 were used to guide specifications of this research.

Ethics and dissemination

The proposed scoping review has the potential to improve research and inform policy makers, healthcare providers, clinicians and researchers on how health information technologies are used in preventive medicine. This scoping review could help advance research by showing the type of evidence and strategies available and by highlighting the need for further research in the field. This scoping review will provide a platform to list out the different health information technologies studied in the literature for their uses in primary prevention.

Due to the use of the publicly available, published data, this study will not require an ethical approval.

Authors' contributions

AA and EM participated in the design and development of the protocol. AA and EM drafted the manuscript. AM, JC, DB and GW reviewed the second draft. AA and EM incorporated and addressed the feedback from the authors. All authors read and approved the final manuscript.

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Competing interests

All authors completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf. Financial support was obtained from the Sir David Cooksey Fellowship in Healthcare Translation at the University of Oxford. There are no relevant conflicts of interest, financial or other types of relationships that may influence the manuscript declared by authors. Authors do not have any patents and are not associated to any conditions or circumstances that may lead to conflicts of interest.

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Appendices:

Appendix 1: Table displaying the PRISMA-P 2015 Checklist

PRISMA-P 2015 Checklist

This checklist to be used for the Systematic Reviews protocol submission was adapted from Table 3 in Moher D et al: Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. Systematic Reviews 2015 4:1

Section and Topic	#	Checklist Item	Information reported		Page number(s)
			Yes	No	
Administrative information					
Title					
identification	1a	Identify the report as a protocol of a systematic review	☐	☒	
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	☐	☒	
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	☐	☒	
Authors					
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	☒	☐	1
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	☒	☐	11
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	☐	☒	
Support					
Sources	5a	Indicate sources of financial or other support for the review	☒	☐	11

Section and Topic	#	Checklist Item	Information reported		Page number(s)
			Yes	No	
Sponsor	5b	Provide name for the review funder and/or sponsor	☒	☐	11
Role of Sponsor or Funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	☒	☐	11
Introduction					
Rationale	6	Describe the rationale for the review in the context of what is already known	☒	☐	3-4
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	☒	☐	6
Methods					
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	☒	☐	7-8
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	☒	☐	6-7
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	☒	☐	17
Study records:					
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	☒	☐	7
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	☒	☐	7

Section and Topic	#	Checklist Item	Information	Page

			reported		number(s)
			Yes	No	
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	☒	☐	7, 18
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	☒	☐	7-8
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	☒	☐	7-10 18
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	☐	☒	
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised	☐	☒	
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I2 , Kendall's τ)	☐	☒	
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	☐	☒	
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	☐	☒	
Meta bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	☐	☒	
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	☐	☒	

Appendix 2: Proposed MEDLINE Literature Search Strategy

Concept	Medical Subject Headings (MeSH)	Search terms
Health Information Technologies	Medical Informatics/	electronic patient record* OR electronic medical record* OR personal health record* OR Health information exchange or technology OR telemedicine OR text message* OR sms OR telephone OR computerized decision support system OR public health informatic* OR cellular phone* OR smartphone* OR mobile* OR ipad* or computer-assisted OR user-computer interface OR personal digital assistant OR computer* OR handheld OR electronic wearable device* OR electronic wearable technology OR data
Primary Prevention	Quality of Life/ tobacco use/ smoking/ dietary services/ preventive health services/ early intervention (education)/ early medical intervention/ health education/ primary prevention/ immunization/	exercise OR physical activity OR diet OR healthy behavior* OR weightloss OR weight change OR weight reduction OR weight management OR weight gain OR smoking cessation OR disease prevention

Appendix 3: Data abstraction form

Reviewer		**Date**
Scoping review of Health information technology used for primary prevention in preventive medicine		
Publication Information		
Study		**First Author**
Year of Publication	**Journal**	
Country	**Discipline**	
Health information technology(ies) studied		
Objective 1	**General description of the health information technology(ies) studied**	
	The primary prevention purpose of the health information technology	
Objective 2	**Primary prevention patient outcome(s) studied**	
Objective 3	**Is there a comparator to the health information technology, if so, how is it different than the comparator?**	

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Secondary Subject Heading:	Diagnostics
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- A limitation of this study is that it will not perform a formal quality assessment of included studies.

BACKGROUND

Health information technology (HIT) include technologies that enable health information to be stored, disseminated and analysed [1] and are increasingly used to improve the health of patients and populations. Popular examples of HITs include electronic health records, smartphone health applications (apps) and electronic prescriptions (E-prescribing) [1]. Evidence from existing systematic reviews and empirical studies found positive effects of using HITs in improving health outcomes. Research shows that HITs can not only improve health outcomes but also contribute to preventing disease and improving preventive medicine practices. Preventive medicine is the practice that focuses on keeping individuals healthy and its goal is to "protect, promote, and maintain health and well-being and to prevent disease, disability, and death" [2]. Primary prevention is one of the preventive medicine measures and it is defined as the prevention of "the initial occurrence of a disorder" by the World Health Organization [3]. Despite the potential benefits HITs can have to improve primary prevention, and the availability of studies about the use of HITs for primary prevention, there are currently no studies that comprehensively review the different types of HITs and their uses in primary prevention.

HITs have seen a growing interest in the literature in recent years and have been repeatedly associated with preventing disease [4-6] improving health outcomes [7] improving data collection, and the potential to substantially advance healthcare research [8-10]. As different HITs proliferate, questions about their effectiveness are being raised. HITs are associated with positive outcomes in healthcare in general such as "efficiency of care", "effectiveness of care" and "patient safety" [10].

Reviews related to the use of HITs in primary prevention focus on only one or two types of health information technologies (e.g. telephone-based interventions only) [11]. Most of the studies that focus on primary prevention outcomes focus on one tool or method of HITs like electronic health records [8] or mobile health technologies [5]. However, these studies are not representative of the whole range of HITs that can be used in primary prevention. In addition, some of the currently available reviews, even if includes more than one HIT, only focuses on one or two primary prevention outcomes (e.g. smoking) [9].

This review will focus on gathering information on what is available rather than which interventions work best. This general focus allows the examination of all the available interventions in health information technologies. In this review, we will map out the findings and results of studies published about health information technologies and their uses in primary prevention preventive

medicine. A scoping review can help clarify to what extent are HITs used for primary prevention purposes and what is the range of the HITs available. We will synthesize the available evidence to inform how technology could be developed to impact primary prevention in preventive medicine. In this protocol we have reviewed some HITs used for primary prevention in Table 1, as example of the scoping review outcomes that will result from the study.

Intervention	**Primary prevention uses**	**Description of intervention**
Mobile phone messaging (SMS or MMS)	Smoking cessation (Rodgers et al., 2005)	Personalized smoking-related and general healthy behaviour-related messages sent to participants as part of a smoking cessation programme. The intervention had other features like being able to text other participants, requesting texts on quitting-related tips and taking polls and quizzes about smoking [9].
	Adherence in taking vitamin C for preventive reasons (Cocosila et al., 2009)	Text message sent from a virtual character to remind to take a Vitamin C pill to participants, where they are expected to "acknowledge" the reminder. If the text was acknowledged an encouraging message is sent, if not, a reminder message in sent. The encouraging messages were described as amusing while the reminder messages were described as "non-amusing" [12].
	Healthy behaviour in children (Shapiro et al., 2008)	Feedback text messages sent as part of a programme to promote healthy behaviors in children (to increase physical activity, reduce sugary beverage consumption and screen time). The feedback text messages were sent once the participants send a text message informing their achievement of predetermined healthy behaviour related goals [13].
Internet-based interventions	Smoking prevention (Buller et al., 2008)	Internet-based programme for school-children that uses "audio narration, graphics, animation, sound effects, and music" to deliver lessons for smoking prevention with survey questions asked to personalize the lessons for the student [14].
	HIV prevention (Kasatpibal et al., 2014)	Internet-based educational programme that uses "texts, pictures, animation, animated cartoons, videos, message boards, and exercise" to teach about the risks of HIV for men who have sex with men [15].

	Obesity prevention (Rerksuppaphol and Rerksuppaphol, 2017)	Internet-based programme for school-aged children to track weight and nutrition-related information and provide personalized information about nutrition and physical activity based on the user's weight/health status [16].
Telephone-based intervention	Postpartum depression prevention (Lewis et al., 2012)	A telephone-based intervention to increase exercise (known to prevent postpartum depression) as part of a prevention programme. The telephone-based intervention is used to inform and educate the participants about exercising, explain exercise recommendations, and encourage participants to maintain exercising [17].
Smartphone application (app)	Diabetes prevention (Fukuoka et al., 2015)	An interactive app with a "self-monitoring" tool and a list of tasks for activities that can prevent diabetes like physical activity. The app also provides encouraging feedback based on the user's input [18].

Table 1: Description of preliminary list of existing health information technology uses in primary prevention

AIMS & OBJECTIVES

The aim of this review is to provide an overview of all HITs that are used for the purpose of primary prevention or to achieve primary prevention outcomes. Through this review, the available HITs, their uses, limitations and gaps in the literature regarding their use in primary prevention will be reported. The objectives of the review are the following:

- To identify the health information technologies that are used for primary prevention and to analyse both the benefits and risks achieved by their use.
- To identify the primary prevention patient outcomes that are impacted by the use of health information technologies.

METHODS

To outline the protocol of the forthcoming scoping review, we will be using the Preferred Reporting Items for Systematic Reviews and Meta-analysis for Protocols (PRISMA-P) (Appendix 1).

Protocol Design

We will use the Arksey and O'Malley methodological framework for scoping reviews in performing the review. The framework recommends following six steps to conduct a scoping review: (1) identifying the research question; (2) identifying relevant studies; (3) selecting studies; (4) charting the data; and (5) collating, summarising and reporting the results [19]. This framework is being used for this review because it applies a rapid form of knowledge synthesis, with the intent to identify the merits of the underlying research question. This form of review is intended to be a precursor for potential further work, as on initial analysis it is unclear if a more sophisticated review method is warranted.

Stage 1: Identifying the research question

The preliminary research (Table 1) revealed that there are no review studies that reviewed the different HIT approaches used in primary prevention and exposed a research gap that motivated the focus of this protocol. The main research question and the secondary research questions of the scoping review are displayed in Table 2.

Primary Research Questions	Secondary Research Questions
What health information technologies are used in primary prevention preventive medicine to impact individuals/patients health outcomes?	• What tools and innovations of health information technologies are used in primary prevention preventive medicine? • What primary prevention preventive medicine patient/individual health outcomes are impacted by the use of HITs? • What are the risks and benefits associated with HITs? • How are the use of HITs changing/improving primary prevention preventive medicine compared to standard/traditional methods?

Table 2: Scoping review primary and secondary research questions

Stage 2: Identifying relevant studies

Search strategy

For the scoping review, we will conduct searches in relevant electronic databases: MEDLINE, EMBASE, the Cochrane Methodology Register, Cochrane Database of Systematic Reviews, CINAHL, SCOPUS and Web of Science. The initial literature search strategy used for Medline can be found in (Appendix 2), including the medical subheadings (MeSH) and free text terms used to perform the search. The search strategy will be modified for each database and further iterated as we explore the research question with changes captured in the review process. Studies will not be limited in terms of year or study design. Only studies in English language will be reviewed. Apart from electronic databases, we will also search reference lists of the studies selected for full text reading to supplement the search.

Stage 3: Study Selection

Screening of the studies will be performed by two suitably experienced/qualified reviewers and in two levels. Table 3 outlines the inclusion criteria that will be used by the reviewers to determine the studies that will be included. The citation management software program; EndNote X8.2 (Clarivate Analytics, USA), will be used to manage records and data and to remove duplicates. The first screening will involve screening the title and abstracts. Using two reviewers will ensure that all

relevant articles are included. The reviewers will use the pre-defined relevance criteria to determine relevant studies. In the second round of screening, the reviewers will perform full text reading of the studies identified in the previous round. Conflicts and discrepancies will be resolved by discussing with a third party.

Inclusion Criteria	
Population	• Users of the health information technologies will include individuals or patients who are treated with primary prevention preventive medicine.
Intervention	• All health information technologies (e.g. electronic health records, telemedicine, text messages, computerized decision support systems...).
Comparator	• Studies using non-health information technology interventions • Studies using traditional or usual method as a comparator to health information technology • Studies without a comparator
Outcomes	• Any primary prevention outcome that prevents a disease or a health-threatening condition or a behaviour before it occurs (e.g. chronic disease prevention, smoking prevention, obesity prevention)
Study Type	• Any study type; experimental (randomised controlled trials (RCTs), quasi-RCTs, non-RCTs), quasi-experimental (controlled before after, interrupted time series) and observational (cohort, case control, cross-sectional) and review (systematic review, meta-analysis scoping review) studies. • Only publications in English will be included. • There will be no restrictions to calendar date; we intend to capture a broad survey of technologies developed and therefore are not restricting date range.

Table 3: Review inclusion criteria

Exclusion Criteria

- Interventions that focus on secondary or tertiary prevention will be excluded to keep the focus on the primary prevention interventions only.
- Publications that are not in English will be excluded.

Stage 4: Charting the data

Two reviewers will independently extract the data and vigilantly review the studies based on the data abstraction form (Appendix 3). We assume that studies identified for this review will include basic study information like: first author and year of publication and will include information about the health information technology intervention and the methods used in the study. Following review of the primary studies types to be included in the review, an appropriate quality assessment standard shall be used to assess the quality of the included papers.

Stage 5: Collating, summarizing and reporting the results

The studies identified from this scoping review will be summarized and analysed using quantitative and qualitative methods. In terms of quantitative methods, we will report simple numerical counts of information such as: the total number of studies, types of primary prevention HIT interventions, descriptions of the study samples and regarding qualitative methods, we will conduct a narrative synthesis to provide an overview of the breadth of the literature and to identify gaps that may need further research. To address the three research questions of the review, we will analyse the data following three synthesis objectives: to identify the health information technologies that are used for primary prevention, to identify the primary prevention patient outcomes that are improved by the use of health information technologies and to map out the ways health information technologies are changing/improving primary prevention compared to standard/traditional methods. Table 4 displays each of the synthesis objectives of the review followed by the method, guide questions and outputs that will be used to achieve them.

Synthesis objective	**Method**	**Guide Questions**	**Outputs**

1. To identify the health information technologies that are used for primary prevention.	We will summarize the identified studies by the health information technology used	What is the health information technology? What is the purpose of the health information technology and how does the purpose contribute to primary prevention? In what setting is the primary prevention technology used? (e.g. healthcare, community setting…etc) What type of evidence does the study provide for primary prevention related health outcomes?	A list of the health information technologies used for primary prevention purposes. A list of the settings that the health information technologies are used in categorization of the primary prevention related outcomes.
2. To identify the primary prevention patient outcomes that are improved by the use of health information technologies.	We will strictly identify the studies that reported significant improved patient outcomes as a result of using health information technologies	What are the studies that reported significant improved patient outcomes and what is the criteria they used to represent significance? How health information technologies that improve patient outcomes are used to improve primary prevention measures? Are there any disadvantages of using the health information technologies for	Identification of the health information technologies that contribute significant improved patient outcomes in the literature. A thematic report of the health information technology uses in primary prevention.

		primary prevention? Can the health information technology be translated and used in different healthcare-related settings?	
3. Map out the ways health information technologies are changing/improving primary prevention compared to standard/traditional methods.	We will identify the articles that compare health information technology interventions to traditional or standard interventions	Did the study compare primary prevention health outcomes to other standard or traditional methods of primary prevention? What outcomes did the study report to compare the health information technologies to other methods? How long were the health information technologies and other methods compared for?	A summary of the health information technologies that were reported to have superior primary prevention outcomes when compared to traditional or standard methods to map out the specific health information technologies that have been compared to traditional or standard methods of primary prevention.

Table 4: Data analysis plan by the synthesis objectives and anticipated outputs

Patient and Public Involvement
Research interests identified and prioritised by the members of the public in a workshop by the European Scientific Institute, on July 2018 were used to guide specifications of this research.

Ethics and dissemination
The proposed scoping review has the potential to improve research and inform policy makers, healthcare providers, clinicians and researchers on how health information technologies are used in preventive medicine. This scoping review could help advance research by showing the type of evidence and strategies available and by highlighting the need for further research in the field. This scoping review will provide a platform to list out the different health information technologies studied in the literature for their uses in primary prevention.

Due to the use of the publicly available, published data, this study will not require an ethical approval.

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Contributorship Statement
AA and EM participated in the design and development of the protocol. AA and EM drafted the manuscript. AM, JC, DB and GW reviewed the second draft. AA and EM incorporated and addressed the feedback from the authors. All authors read and approved the final manuscript. All authors completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf. There are no relevant conflicts of interest, financial or other types of relationships that may influence the manuscript declared by authors. Authors do not have any patents and are not associated to any conditions or circumstances that may lead to conflicts of interest.

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Appendices:

Appendix 1: Table displaying the PRISMA-P 2015 Checklist

PRISMA-P 2015 Checklist

This checklist to be used for the Systematic Reviews protocol submission was adapted from Table 3 in Moher D et al: Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. Systematic Reviews 2015 4:1

Section and Topic	#	Checklist Item	Information reported		Page number(s)
			Yes	No	
Administrative information					
Title					
identification	1a	Identify the report as a protocol of a systematic review	☐	☒	
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	☐	☒	
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	☐	☒	
Authors					
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	☒	☐	1
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	☒	☐	11
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	☐	☒	
Support					
Sources	5a	Indicate sources of financial or other support for the review	☒	☐	11

Section and Topic	#	Checklist Item	Information reported		Page number(s)
			Yes	No	
Sponsor	5b	Provide name for the review funder and/or sponsor	☒	☐	11
Role of Sponsor or Funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	☒	☐	11
Introduction					
Rationale	6	Describe the rationale for the review in the context of what is already known	☒	☐	3-4
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	☒	☐	6
Methods					
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	☒	☐	7-8
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	☒	☐	6-7
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	☒	☐	17
Study records:					
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	☒	☐	7
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	☒	☐	7

Section and Topic	#	Checklist Item	Information	Page

			reported		number(s)
			Yes	No	
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	☒	☐	7, 18
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	☒	☐	7-8
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	☒	☐	7-10 18
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	☐	☒	
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised	☐	☒	
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I2 , Kendall's τ)	☐	☒	
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	☐	☒	
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	☐	☒	
Meta bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	☐	☒	
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	☐	☒	

Appendix 2: Proposed MEDLINE Literature Search Strategy

Concept	Medical Subject Headings (MeSH)	Search terms
Health Information Technologies	Medical Informatics/	electronic patient record* OR electronic medical record* OR personal health record* OR Health information exchange or technology OR telemedicine OR text message* OR sms OR telephone OR computerized decision support system OR public health informatic* OR cellular phone* OR smartphone* OR mobile* OR ipad* or computer-assisted OR user-computer interface OR personal digital assistant OR computer* OR handheld OR electronic wearable device* OR electronic wearable technology OR data
Primary Prevention	Quality of Life/ tobacco use/ smoking/ dietary services/ preventive health services/ early intervention (education)/ early medical intervention/ health education/ primary prevention/ immunization/	exercise OR physical activity OR diet OR healthy behavior* OR weightloss OR weight change OR weight reduction OR weight management OR weight gain OR smoking cessation OR disease prevention

Appendix 3: Data abstraction form

Reviewer		**Date**
Scoping review of Health information technology used for primary prevention in preventive medicine		
Publication Information		
Study		**First Author**
Year of Publication	**Journal**	
Country	**Discipline**	
Health information technology(ies) studied		
Objective 1	**General description of the health information technology(ies) studied**	
	The primary prevention purpose of the health information technology	
Objective 2	**Primary prevention patient outcome(s) studied**	
Objective 3	**Is there a comparator to the health information technology, if so, how is it different than the comparator?**	